

REMARKS/ARGUMENTS

The Office Action mailed June 7, 2006, has been received and reviewed. Claims 1 through 33 are currently pending in the application. Claims 1 through 25 have been allowed. Claims 26 through 33 stand rejected.

Reconsideration of the above-referenced application in view of the arguments presented below is respectfully requested.

35 U.S.C. § 102(b) Anticipation Rejections

Anticipation Rejection Based on U.S. Patent No. 6,645,852 to Taguchi et al.

Claims 26, 27, 31 and 32 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Taguchi et al. (U.S. Patent No. 6,645,852 B1). Applicants respectfully traverse this rejection, as hereinafter set forth.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Applicants respectfully assert that independent claims 26, 31, and 32 are not anticipated by Taguchi et al. under 35 U.S.C. § 102(b) because Taguchi et al. does not describe each and every element of independent claims 26, 31, and 32. In particular, Taguchi et al. does not describe a “reversed oxidation injury [of the] metallic layer,” as recited in independent claims 26, 31, and 32.

Taguchi et al. describes forming a trench 21 in both a silicone oxide film 20 and a low dielectric-constant organic film 19, and further forming a via hole 22 in both a silicone oxide film 18 and a low dielectric-constant organic film 17, so that the via hole reaches a first wiring 15. *Taguchi et al.*, column 5, lines 29-35. Taguchi et al. further describes a plasma treatment using a gas containing hydrogen gas is conducted while cooling the substrate, and then, a barrier layer 24 is formed on the inner surface of the trench 21 and the trench is plugged with copper. *Id.*, column 5, lines 40-65. However, Taguchi et al. does not describe an oxidation injury to the first wiring 15, nor does Taguchi et al. describe the plasma treatment as reversing an oxidation

injury to the first wiring 15. Taguchi et al. merely states “the above-described hydrogen plasma treatment conducted before forming the barrier layer is effective for removing the oxide film and contaminants on the bottom portion of the recess portion.” *Id.*, column 6, lines 33-36.

As Taguchi et al. does not describe a “reversed oxidation injury [of the] metallic layer,” as recited in independent claims 26, 31, and 32, Applicants assert that claims 26, 31, and 32 are not anticipated by Taguchi et al. and respectfully request that the Examiner withdraw the rejection of independent claims 26, 31, and 32 under 35 U.S.C. § 102(b).

Applicants additionally assert that dependent claim 27 is allowable at least because it depends from claim 26, which is allowable. Therefore, Applicants assert that claim 27 is not anticipated by Taguchi et al. and respectfully request that the Examiner withdraw the rejection of dependent claim 27 under 35 U.S.C. § 102(b).

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent No. 6,645,852 to Taguchi et al. in View of U.S. Patent No. 6,424,042 to Kitani, and Further in View of U.S. Application Publication No. 2002/0030215 to Oashi et al.

Claim 28 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Taguchi et al. (U.S. Patent No. 6,645,852) in view of Kitani (U.S. Patent No. 6,424,042), and further in view of Oashi et al. (U.S. Application Publication No. 2002/0030215). Applicants respectfully traverse this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant’s disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

The 35 U.S.C. § 103(a) obviousness rejection of claim 28 is improper because none of the cited prior art references teach or suggest “an at least partly **reversed oxidation injury** in a metallic layer,” as recited in independent claim 26, from which claim 28 indirectly depends.

As previously discussed herein, Taguchi et al. does not teach or suggest an at least partly reversed oxidation injury.

Kitani teaches a method of forming a damascene structure in a semiconductor device. The damascene structure provides an interconnection between interconnection layers in the device. *Kitani*, column 3, lines 36-44. Certain features of the structure are configured to minimize adverse effects associated with the “dishing” phenomenon. *Id.*, column 4, line 54 – column 5, line 13. Kitani does not, however, teach or suggest an at least partly reversed oxidation injury as recited in claim 26, from which claim 28 indirectly depends.

Oashi et al. teaches a semiconductor device that includes an integrated circuit having copper wires and copper diffusion blocking means provided in a region surrounding a memory storage portion of the device. *Oashi et al.*, page 1, paragraph [0012] – page 2, paragraph [0013]. Oashi et al. does not, however, teach or suggest a damascene structure that includes an at least partly reversed oxidation injury in a metallic layer, as recited in claim 26, from which claim 28 indirectly depends.

As the cited prior art references fail to teach or suggest each of the limitations of claim 26, from which 28 depends, Applicants respectfully assert that the invention of dependent claim 28 would not have been obvious to one of ordinary skill in the art at the time the invention was made, and request that the Examiner withdraw the rejection of dependent claim 28 under 35 U.S.C. § 103(a).

Obviousness Rejection Based on U.S. Patent No. 6,885,080 to Chen et al. in View of U.S. Patent Application Publication No. US 2002/0030215 to Oashi et al., and Further in View of U.S. Patent No. 6,645,852 to Taguchi et al.

Claims 29, 30, and 33 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen et al. (U.S. Patent No. 6,885,080) in view of Oashi et al. (U.S. Patent Application Publication No. US 2002/0030215), and further in view of Taguchi et al. (U.S. Patent No. 6,645,852). Applicants respectfully traverse this rejection, as hereinafter set forth.

The 35 U.S.C. § 103(a) obviousness rejections of independent claims 29 and 33 are improper because none of the cited prior art references teach or suggest a damascene structure comprising “an at least partly **reversed oxidation injury** in a metallic layer,” as recited in each of independent claims 29 and 33.

Chen et al. teaches a device having an integrated circuit that includes a dynamic random access memory (DRAM) array on the same substrate as a microprocessor core or other logic device. *Chen et al.*, column 1, lines 11-14. Chen et al. does not, however, teach or suggest a damascene structure that includes an at least partly reversed oxidation injury in a metallic layer, as recited in each of independent claims 29 and 33.

Oashi et al. teaches a semiconductor device that includes an integrated circuit having copper wires and copper diffusion blocking means provided in a region surrounding a memory storage portion of the device. *Oashi et al.*, page 1, paragraph [0012] – page 2, paragraph [0013].

Oashi et al. does not, however, teach or suggest a damascene structure that includes an at least partly reversed oxidation injury in a metallic layer, as recited in each of independent claims 29 and 33.

As previously discussed herein, Taguchi et al. does not teach or suggest an at least partly reversed oxidation injury.

As the cited prior art references fail to teach or suggest each of the limitations of each of independent claims 29 and 33, Applicants respectfully assert that the inventions of independent claims 29 and 33 would not have been obvious to one of ordinary skill in the art at the time the inventions were made, and request that the Examiner withdraw the rejections of independent claims 29 and 33 under 35 U.S.C. § 103(a).

Regarding dependent claim 30, the nonobviousness of independent claim 29 precludes a rejection of claim 30, which depends therefrom, because a dependent claim is obvious only if the independent claim from which it depends is obvious. *See In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988), *see also* MPEP § 2143.03. Therefore, the Applicants request that the Examiner withdraw the 35 U.S.C. § 103(a) obviousness rejections to independent claim 29 and to claim 30, which depends therefrom.

CONCLUSION

Claims 26 through 33 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicants' undersigned attorney.

Respectfully submitted,

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